

Monday 18 April 2016

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Interventions and Management

1. *J Phys Ther Sci.* 2016 Jan;28(2):695-700. doi: 10.1589/jpts.28.695. Epub 2016 Feb 29.

Kinematic upper limb evaluation of children and adolescents with cerebral palsy: a systematic review of the literature.

Franco de Moura RC, Almeida CS, Dumont AJ, Lazzari RD, Lopes JB, Duarte NA, Braun LF, Oliveira CS.

[Purpose] The aim of the present study was to perform a review of the literature on objective measures of upper limb movements in children and adolescents with cerebral palsy and describe the methods used to investigate upper limb kinematics in this population. [Materials and Methods] An extensive database search was performed using the keywords kinematics, upper limb, and cerebral palsy. A total of 146 papers were identified, but only five met the inclusion criteria. [Results] No consensus was found regarding the data collection, processing, and analysis procedures or reporting of the results. [Conclusion] Standardization of the protocol for 3D upper limb movement analysis will provide the foundation for comparable, reproducible results and eventually facilitate the planning of treatment interventions.

[PMID: 27065566](#)

2. *J Phys Ther Sci.* 2016 Jan;28(2):347-50. doi: 10.1589/jpts.28.347. Epub 2016 Feb 29.

An investigation of the factors affecting handwriting articulation of school aged children with cerebral palsy based on the international classification of functioning, disability and health.

Kim HY.

[Purpose] This study was designed to identify factors influencing handwriting articulation based on the international classification of functioning, disability and health (ICF) and to recommend effective evaluation and intervention strategies to improve the handwriting of children with cerebral palsy. [Subjects] The subjects were 96 elementary school children with cerebral palsy and the study was conducted from 04/07/2011 to 29/08/2011. [Methods] Factors related to handwriting articulation were investigated based on the ICF model. [Results] Wrist lateral deviation, upper-extremity speed of body function and education of personal factor were significantly associated with handwriting articulation. [Conclusion] Efforts to manage and improve the handwriting articulation of children with cerebral palsy should focus on wrist lateral deviation, upper-extremity speed, and education.

[PMID: 27065517](#)

3. *Phys Occup Ther Pediatr.* 2016 Apr 11:1-16. [Epub ahead of print]

Hand Function in Young Children with Cerebral Palsy: Current Practice and Parent-Reported Benefits.

Klevberg GL, Østensjø S, Elkjær S, Kjekken I, Jahnsen RB.

AIMS: To (1) describe characteristics of current interventions to improve hand function in young children with Cerebral Palsy (CP), and explore factors associated with (2) increased likelihood of hand and ADL training and (3) child benefits of training. **METHODS:** A cross-sectional design was used with parent-reported data and data from the Norwegian CP Follow-up Program (CPOP). A total of 102 children (53% of the cohort of newly recruited children in the CPOP, mean age: 30.3 months, SD: 12.1) were included. Hand function was classified according to the Mini-Manual Ability Classification System (Mini-MACS). Data were analyzed with descriptive statistics, cross-tables and direct multiple logistic regressions. **RESULTS:** The majority of the children performed training of hand skills and ADL. Parents reported high amounts of training, and training was commonly integrated in everyday activities. Both parents (OR = 5.6, $p < .011$) and OTs (OR = 6.2, $p < .002$) reported more hand training for children at Mini-MACS levels II-III compared to level I. Parents reported larger child benefits when training was organized as a combination of training sessions and practice within everyday activities (OR = 7.090, $p = .011$). **CONCLUSIONS:** Parents reported that the children's everyday activities were utilized as opportunities for training, hence describing the intensity of therapy merely by counting minutes or number of sessions seems insufficient.

[PMID: 27065199](#)

4. *J Phys Ther Sci.* 2016 Jan;28(2):671-6. doi: 10.1589/jpts.28.671. Epub 2016 Feb 29.

Effects of strength training program on hip extensors and knee extensors strength of lower limb in children with spastic diplegic cerebral palsy.

Aye T, Thein S, Hlaing T.

[Purpose] The purpose of this study was to determine whether strength training programs for hip extensors and knee extensors improve gross motor function of children with cerebral palsy in Myanmar. [Subjects and Methods] Forty children (25 boys and 15 girls, mean age: 6.07 ± 2.74 years) from National Rehabilitation Hospital, Yangon, Myanmar, who had been diagnosed with spastic diplegic cerebral palsy, Gross Motor Classification System I and II participated in a 6-week strength training program (45 minutes per day, 3 days per week) on hip and knee extensors. Assessment was made, before and after intervention, of the amount of training weight in pounds, as well as Gross Motor Function Measure (GMFM) dimensions D (standing) and E (walking, running, jumping). [Results] All scores had increased significantly after the strength-training program. [Conclusion] A simple method of strength-training program for hip and knee extensors might lead to improved muscle strength and gross motor function in children with spastic diplegic cerebral palsy.

[PMID: 27065561](#)

5. *Medicine (Baltimore).* 2016 Apr;95(15):e3385. doi: 10.1097/MD.0000000000003385.

Three Case Reports of Successful Vibration Therapy of the Plantar Fascia for Spasticity Due to Cerebral Palsy-Like Syndrome, Fetal-Type Minamata Disease.

Usuki F, Tohyama S.

Fetal-type Minamata disease is caused by the exposure to high concentrations of methylmercury in the fetal period and shows cerebral palsy-like clinical features. Relief of spasticity is a major task of rehabilitation to improve their activities of daily living. Here we report the effect of long-term vibration therapy on bilateral lower-limb spasticity in 3 patients with fetal-type Minamata disease. We used a simple, inexpensive, and noninvasive approach with hand-held vibration massagers, which were applied to the plantar fascia at 90Hz for 15 minutes. The effect was observed soon after the first treatment and resulted in better performance of the repetitive facilitation. Vibration therapy for 1 year improved Modified Ashworth Scale for the ankle flexors in 2 cases. The labored gait improved and gait speed increased in another case. Continued vibration therapy for another 1 year further improved Modified Ashworth Scale score and range of motion of ankle dorsiflexion in 1 case. This case showed the decreased amplitude of soleus H-reflex after the 15-minute vibration therapy, suggesting that α -motor neuron excitability was suppressed. Vibration therapy using a hand-held vibration massager may offer safe and effective treatment for lower-limb spasticity in patients with chronic neurological disorders.

[PMID: 27082608](#)

6. J Phys Ther Sci. 2016 Jan;28(2):658-60. doi: 10.1589/jpts.28.658. Epub 2016 Feb 29.

Differences in proprioceptive senses between children with diplegic and children with hemiplegic cerebral palsy.

Ryu HJ, Song GB.

[Purpose] In the present study, in order to examine the differences in proprioceptive senses between children with diplegic CP and children with hemiplegic CP, neck reposition errors were measured. [Subjects and Methods] Head reposition senses were measured after neck flexion, extension, and left-right rotation, using head repositioning accuracy tests. These tests were done with 12 children with diplegic CP and nine children with hemiplegic CP. [Results] The results indicated that children with diplegic CP had poorer head repositioning senses after movements in all directions compared to children with hemiplegic CP. [Conclusion] The results indicated that children with diplegic CP had poorer head repositioning senses after movements in all directions as compared to children with hemiplegic CP.

[PMID: 27065559](#)

7. Indian J Otolaryngol Head Neck Surg. 2016 Mar;68(1):75-9. doi: 10.1007/s12070-015-0926-4. Epub 2015 Dec 12.

Submandibular Duct Re-routing for Drooling in Neurologically Impaired Children.

Sagar P, Handa KK, Gulati S, Kumar R.

Drooling is a challenging situation to manage especially in neurologically impaired pediatric population. Numerous surgical procedures have been described in literature but none of them is standardized. We evaluate the effectiveness of bilateral submandibular duct rerouting and sublingual gland excision in drooling paediatric patients. Prospective interventional study was conducted from November 2007 to September 2009 in twenty-eight pediatric patients with drooling who had failed conservative treatment modalities. Patients underwent bilateral submandibular duct transposition and sublingual gland excision. Patients were assessed pre-operatively, at 7, 30 and 90 days after surgery for drooling severity, frequency as per Thomas-Stonell and Greenberg classification and also number of bibs changed per day. Result was categorized using Wilkie and Brody criteria for assessing effectiveness of the surgery. Twenty-eight patients were successfully operated. All patients were followed-up for a duration of at least 3 months. The success rate achieved in term of control of drooling was 95.2 % at 3 months follow up. Statistically significant difference ($p < 0.001$) was noted in pre-operative and postoperative mean values for severity and frequency of drooling and also bibs/day. Transient, minor complications ($n = 5/28$, 17.8 %) were encountered following this surgical procedure. Bilateral submandibular duct rerouting and sublingual gland excision in drooling paediatric patients is a simple and effective surgery with minor operative morbidity. Concomitant sublingual gland excision bilaterally helps in reducing the incidence of ranula formation significantly.

[PMID: 27066416](#)

8. Int J Speech Lang Pathol. 2016 Apr 6:1-13. [Epub ahead of print]

Social media experiences of adolescents and young adults with cerebral palsy who use augmentative and alternative communication.

Caron JG, Light J.

PURPOSE: This pilot study aimed to expand the current understanding of how adolescents and young adults with cerebral palsy (CP) and complex communication needs use social media. **METHOD:** An online focus group was used to investigate the social media experiences of seven individuals with CP who used Augmentative and Alternative Communication (AAC). Questions posed to the group related to social media: (a) advantages; (b) disadvantages; (c) barriers; (d) supports; and (e) recommendations. **RESULT:** Adolescents with CP who use AAC used a range of communication media to participate in daily interactions, including social media. An analysis of the focus group interaction revealed that the participants used social media to: bypass the constraints of face-to-face interactions; communicate for a number of reasons (e.g. maintain relationships, share experiences); and support independent leisure (e.g. playing games, looking at pictures/videos). Despite the advantages, the participants discussed barriers including limitations related to AAC technologies, social media sites and literacy skills. **CONCLUSION:** The results suggest that service providers should implement interventions to support social media use, including enhancement of linguistic, operational and strategic competence. Technology manufacturers should focus on improving the designs of AAC apps and social media sites to facilitate access by individuals who require AAC.

[PMID: 27063698](#)

9. Int J Speech Lang Pathol. 2016 Apr 4:1-12. [Epub ahead of print]

Communication changes experienced by adults with cerebral palsy as they age.

Dark LJ, Clemson L, Balandin S.

PURPOSE: Adults with cerebral palsy (CP) experience multiple, functional changes as they age, including changes to communication modes and methods that enable development and maintenance of relationships, communicative participation and quality-of-life. Little is known about the nature of communication changes experienced by this group. The aim of this study was to better understand how adults with CP experience changes in their communication abilities as they age and the subsequent psychosocial impact. **METHOD:** Twenty adults with cerebral palsy aged 40-72 years with complex communication needs (CCN) participated in a series of in-depth interviews, framing their experiences of loss and grief throughout their lives. The impact of changing communication abilities emerged as an important area of focus. Data were analysed using constructivist grounded theory methodology. **RESULT:** Themes arising from the participants' perceptions of their communication included experiencing communication change as a loss with subsequent impact on self-concept; and how communication is integral to the process of managing losses associated with older age. **CONCLUSION:** Implications for speech-language pathologists working with older people with cerebral palsy and CCN include the need to understand the psychosocial impact of communication changes on social interaction, relationships and communicative participation. It is important to promote positive and meaningful communication options that maintain a coherent sense of self in addition to promoting functional communication skills and communicative participation.

[PMID: 27063695](#)

Prevention and Cure

10. Brain Dev. 2016 Apr 8. pii: S0387-7604(16)30023-7. doi: 10.1016/j.braindev.2016.03.006. [Epub ahead of print]

Asymptomatic congenital cytomegalovirus infection with neurological sequelae: A retrospective study using umbilical cord.

Uematsu M, Haginoya K, Kikuchi A, Hino-Fukuyo N, Ishii K, Shiihara T, Kato M, Kamei A, Kure S.

BACKGROUND: Congenital cytomegalovirus (CMV) infection causes various neurological sequelae. However, most infected infants are asymptomatic at birth, and retrospective diagnosis is difficult beyond the neonatal period. **OBJECTIVE:** This study aimed to investigate the aspects of neurological sequelae associated with asymptomatic congenital CMV infection. **METHODS:** We retrospectively analyzed 182 patients who were suspected of having asymptomatic congenital CMV infection with neurological symptoms in Japan. Congenital CMV infection was diagnosed by quantitative polymerase chain reaction amplification of CMV from dried umbilical cord DNA. **RESULTS:** Fifty-nine patients (32.4%) who tested positive for CMV were confirmed as having congenital CMV infection. Among 54 congenital CMV patients, major neurological symptoms included intellectual disability (n=51, 94.4%), hearing impairment (n=36, 66.7%) and cerebral palsy (n=21, 38.9%), while microcephaly (n=16, 29.6%) and epilepsy (n=14, 25.9%) were less common. In a brain magnetic resonance imaging (MRI) study, cortical dysplasia was observed in 27 CMV-positive patients (50.0%), and all patients (100%) had cerebral white matter (WM) abnormality. Intracranial calcification was detected by CT in 16 (48.5%) of 33 CMV-positive patients. Cerebral palsy, cortical dysplasia and a WM abnormality with a diffuse pattern were associated with marked intellectual disability. **CONCLUSIONS:** Brain MRI investigations are important for making a diagnosis and formulating an intellectual prognosis. Analysis of umbilical cord tissue represents a unique and useful way to retrospectively diagnose congenital CMV infection.

[PMID: 27068877](#)

11. Nature. 2016 Apr 13. doi: 10.1038/nature17435. [Epub ahead of print]

Restoring cortical control of functional movement in a human with quadriplegia.

Bouton CE, Shaikhouni A, Annetta NV, Bockbrader MA, Friedenber DA, Nielson DM, Sharma G, Sederberg PB, Glenn BC, Mysiw WJ, Morgan AG, Deogaonkar M, Rezai AR.

Millions of people worldwide suffer from diseases that lead to paralysis through disruption of signal pathways between the brain and the muscles. Neuroprosthetic devices are designed to restore lost function and could be used to form an electronic 'neural bypass' to circumvent disconnected pathways in the nervous system. It has previously been shown that intracortically recorded signals can be decoded to extract information related to motion, allowing non-human primates and paralysed humans to control computers and robotic arms through imagined movements. In non-human primates, these types of signal have also been used to drive activation of chemically paralysed arm muscles. Here we show that intracortically recorded signals can be linked in real-time to muscle activation to restore movement in a paralysed human. We used a chronically implanted intracortical microelectrode array to record multiunit activity from the motor cortex in a study participant with quadriplegia from cervical spinal cord injury. We applied machine-learning algorithms to decode the neuronal activity and control activation of the participant's forearm muscles through a custom-built high-resolution neuromuscular electrical stimulation system. The system provided isolated finger movements and the participant achieved continuous cortical control of six different wrist and hand motions. Furthermore, he was able to use the system to complete functional tasks relevant to daily living. Clinical assessment showed that, when using the system, his motor impairment improved from the fifth to the sixth cervical (C5-C6) to the seventh cervical to first thoracic (C7-T1) level unilaterally, conferring on him the critical abilities to grasp, manipulate, and release objects. This is the first demonstration to our knowledge of successful control of muscle activation using intracortically recorded signals in a paralysed human. These results have significant implications in advancing neuroprosthetic technology for people worldwide living with the effects of paralysis.

[PMID: 27074513](#)

12. Brain Dev. 2016 Apr 9. pii: S0387-7604(16)30024-9. doi: 10.1016/j.braindev.2016.03.007. [Epub ahead of print]

Trends in the prevalence of cerebral palsy in children born between 1988 and 2007 in Okinawa, Japan.

Touyama M, Touyama J, Toyokawa S, Kobayashi Y.

AIM: This study aimed to describe trends in CP prevalence among children born between 1988 and 2007 in Okinawa, Japan. METHOD: This study was conducted during two time periods, Period I (from 1988 to 1997) and Period II (from 1998 to 2007), using data from the local CP registration system. We assessed cerebral palsy gestational age and birth weight specific trends in prevalence and analyzed these with Poisson regression analysis. RESULTS: Overall crude CP prevalence was 1.88 per 1000 live births. Approximately 70% of children with CP were born preterm or with low birth weight (LBW). Overall CP prevalence increased in Period I and decreased significantly in Period II ($P<0.05$). Additionally, CP prevalence among children born with a birth weight between 1000 and 1999g increased in Period I and decreased significantly in Period II ($P<0.05$). A significant decrease was found among the children born between 1995 and 2007 with a gestational age between 28 and 31 weeks ($P<0.01$). CONCLUSIONS: There was a decrease in CP prevalence from 1998 to 2007, especially among LBW children and preterm infants. The high CP proportions among LBW and preterm infants are unique features of the population of Okinawa, Japan.

[PMID: 27072917](#)

13. Dev Med Child Neurol. 2016 Apr 6. doi: 10.1111/dmcn.13134. [Epub ahead of print]

Nutritional status and gross motor function in children with cerebral palsy, and implications for Zika virus infection. Leandro CG.

[PMID: 27060691](#)

14. Dev Med Child Neurol. 2016 Apr 5. doi: 10.1111/dmcn.13116. [Epub ahead of print]

Growth characteristics in cerebral palsy subtypes: a comparative assessment.

Stanek JL, Emerson JA, Murdock FA, Petroski GF.

AIM: Children with quadriplegic cerebral palsy (CP) have been found to have growth rates that differ from those of children with typical development. Little research has been performed to distinguish whether growth patterns in hemiplegic, diplegic, and quadriplegic CP differ from one another. The purpose of this study was to compare growth of children with quadriplegic, hemiplegic, and diplegic CP. METHOD: Retrospective data were collected from the electronic medical record of patients with CP at an outpatient center. Linear mixed models were used to examine growth by diagnosis, using International Classification of Diseases, Ninth Revision (ICD-9) diagnosis codes 343.0 (diplegia), 343.1 (hemiplegia), and 343.2 (quadriplegia). RESULTS: Heights and weights of children with quadriplegic CP were consistently lower than those with hemiplegic or diplegic CP. Children with hemiplegic CP had greater heights and weights than other CP subtypes. There were statistically significant differences in weight gain curves among the three diagnoses for males ($p<0.05$). INTERPRETATION: Our study reveals differences in growth rates between hemiplegic, diplegic, and quadriplegic CP subtypes.

[PMID: 27059686](#)